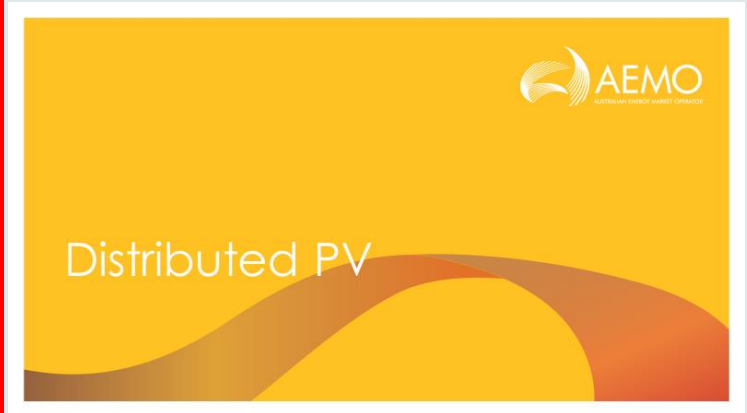


Renewable Integration Study Technical Overview

A summary of key findings and actions

Watch the whole series



Presenters

Chris Davies



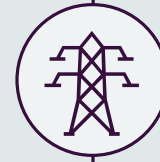
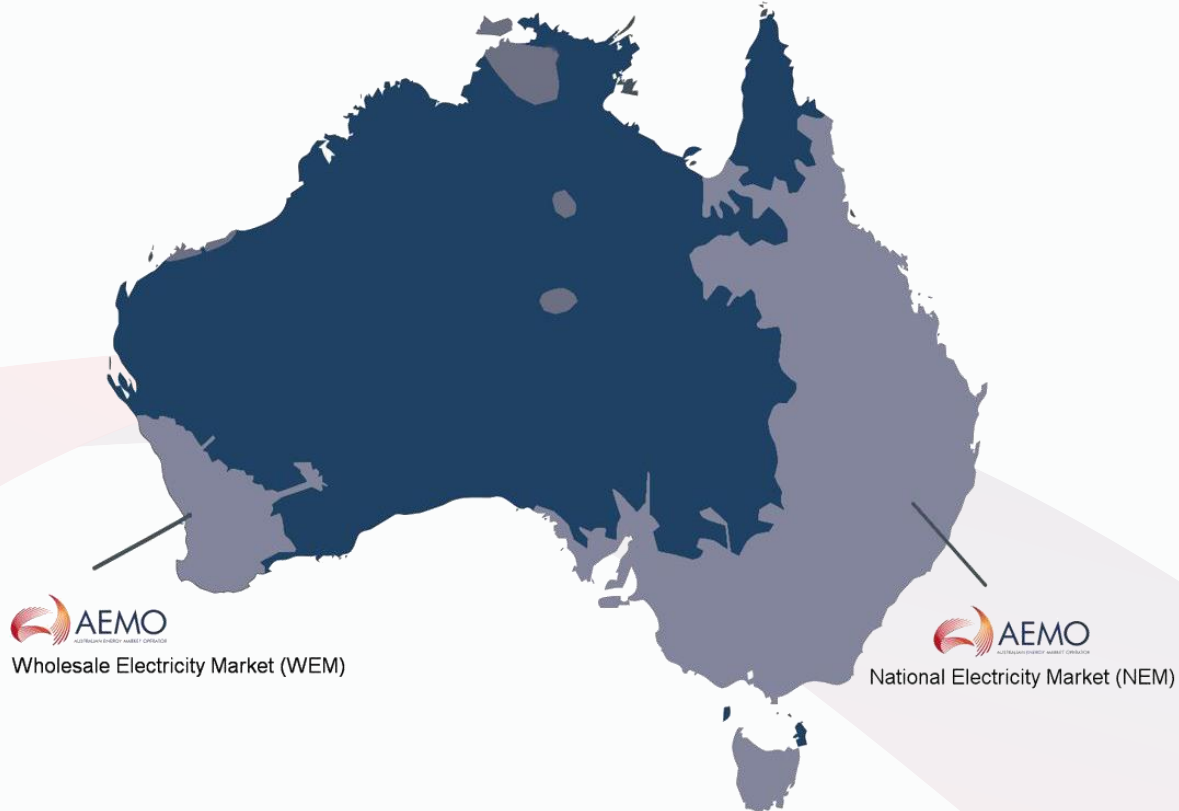
Manager
Future Energy Systems
AEMO

Barry O'Connell



RIS project lead
Future Energy Systems
AEMO

About AEMO



AEMO is the independent system and market operator for the **National Electricity Market (NEM)** and the **WA Wholesale Electricity Market (WEM)**.



We also operate **retail and wholesale gas** markets across south-eastern Australia and Victoria's gas pipeline grid.



Ownership

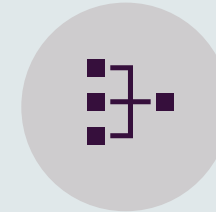
40%
Market participants

60%
Governments of Australia

Today's Webinar



What is the RIS?



Scope development



Key findings and actions

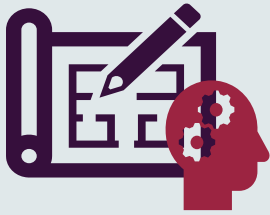


Managing the transition



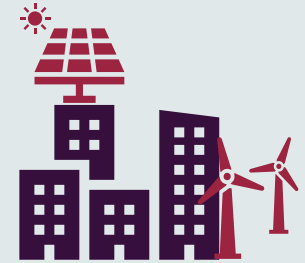
What is the RIS

AEMO is planning for change



AEMO's Integrated System Plan (ISP) is a **whole-of-system plan** that provides an integrated roadmap for the efficient development of the NEM **out to 2040**

But, even changes to 2025 are significant



By 2025 ...

- **10-20 GW** of new wind and solar generation
- Installed capacity of distributed PV could **more than double**

What is the RIS?

Scope

- A technical study into changes needed **to operate the future system** (network and resources) **reliant on renewable generation**
- Utilises ISP modelling and 'energy' scenarios
- Explores **what else we need to do as an industry to prepare** for a future with high levels of wind and solar, in addition to what is already done in the ISP

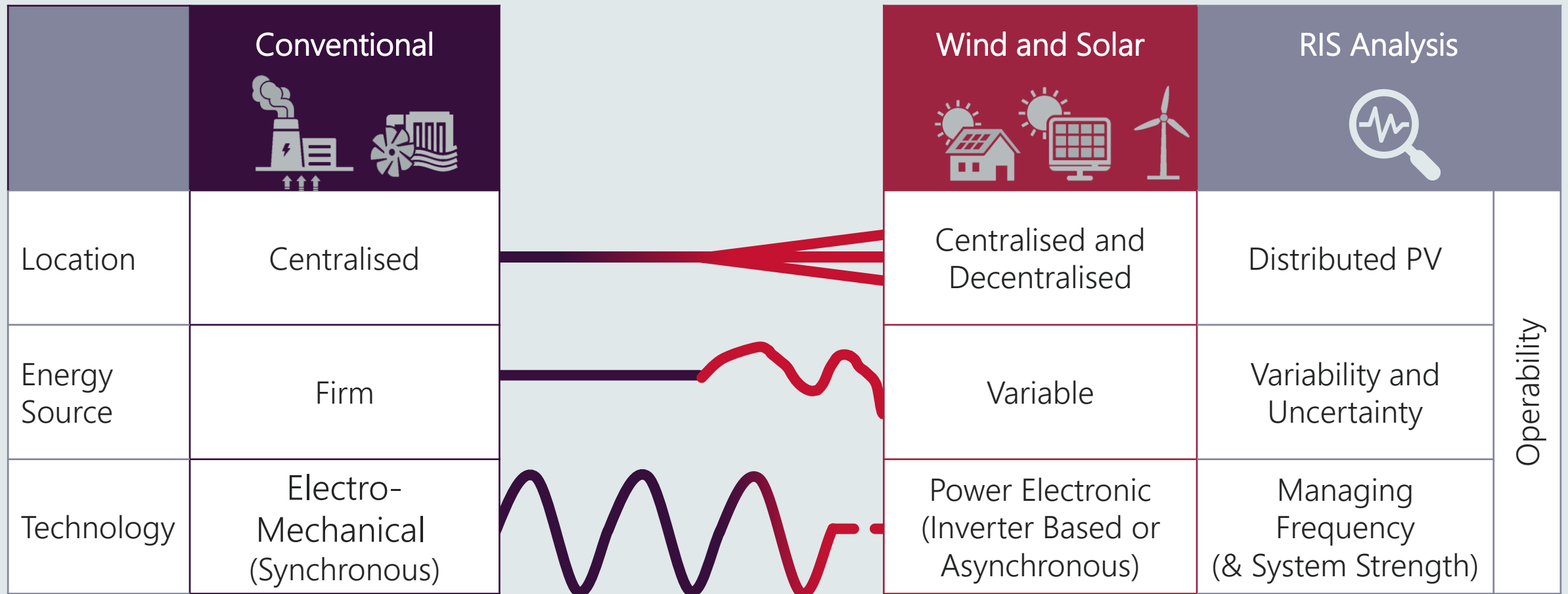
- **Different perspectives** on the needs and challenges of the future NEM
- **New evidence** to support industry transition and maximise the value for end consumers
- **Enhanced actions** to enable the transition towards increasing levels of wind and solar generation

Outcomes



Scope development

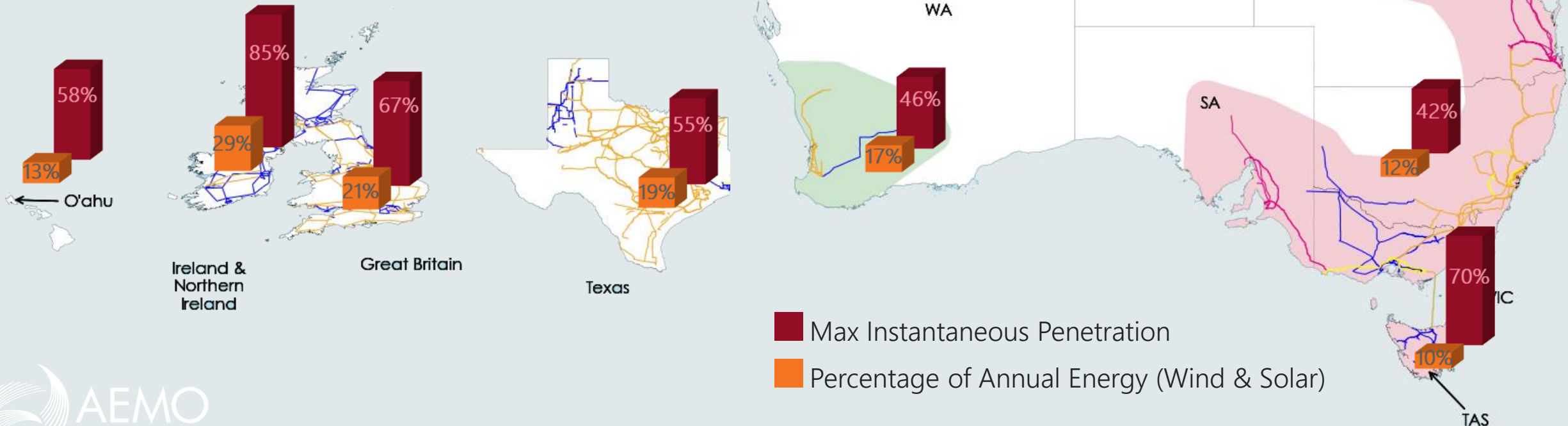
Changing power system characteristics



International comparison (2018 data)

Penetration of wind and solar can be measured as a percentage of total energy in a year, or instantaneously as a percentage of the generation at any point in time.

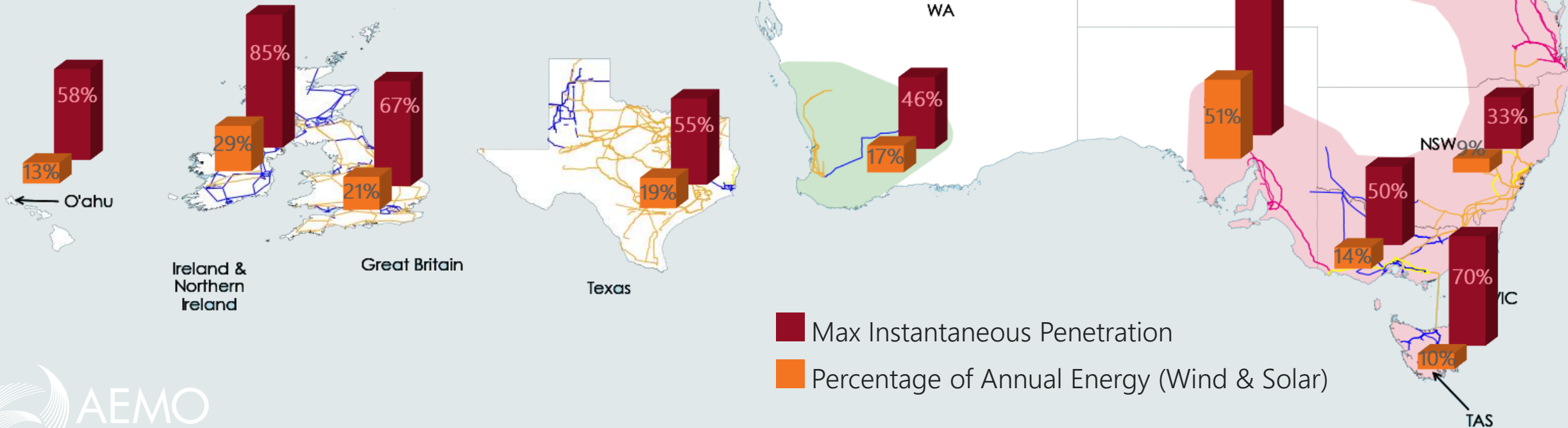
The RIS focuses on instantaneous penetration.



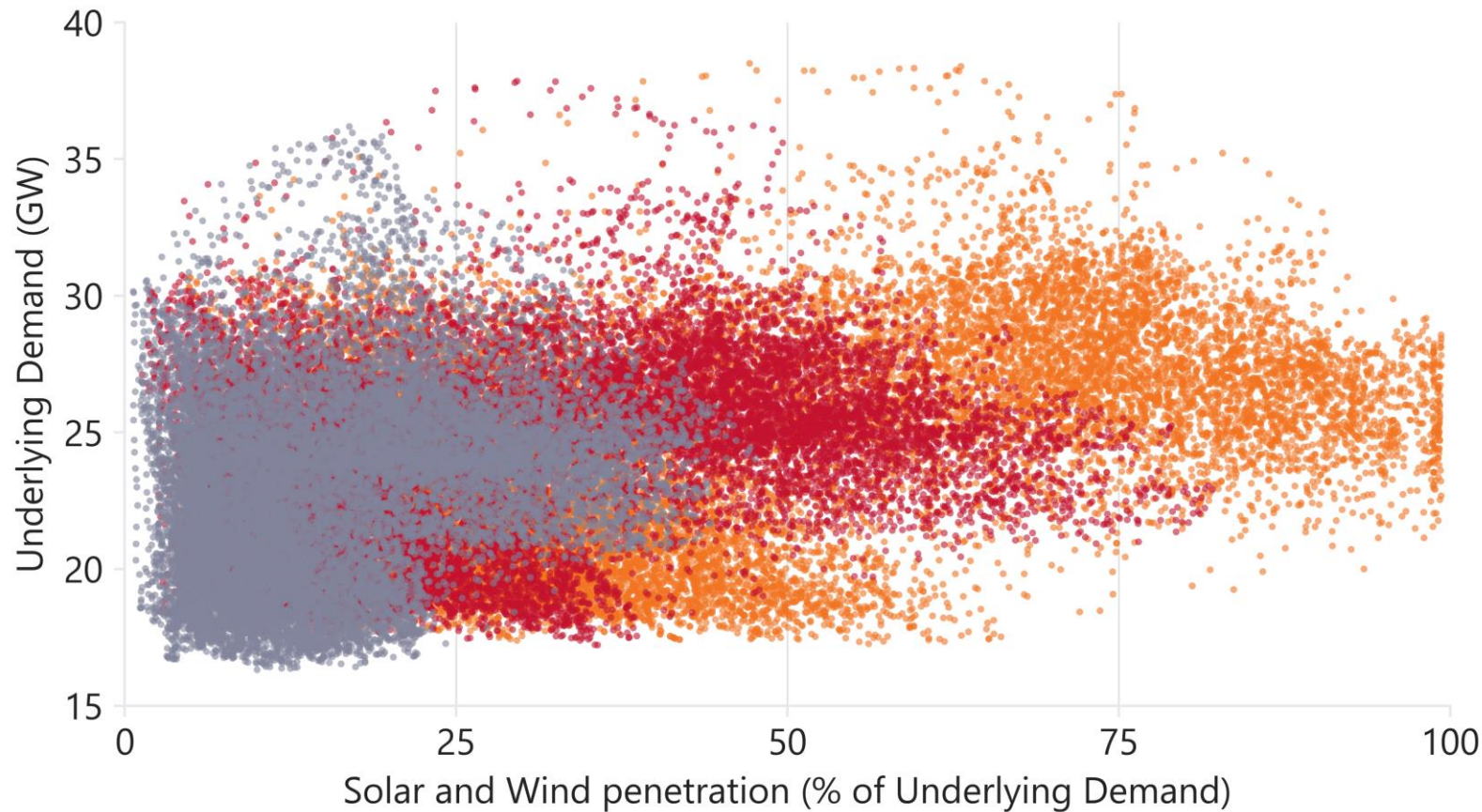
International comparison (2018 data)

Penetration of wind and solar can be measured as a percentage of total energy in a year, or instantaneously as a percentage of the generation at any point in time.

The RIS focuses on instantaneous penetration.



Increasing wind and solar



- In 2019 the **instantaneous penetration of wind and solar generation in the NEM** was just **under 50%**
- By 2025, this could reach:
 - **75%** under the ISP **Central** scenario
 - **100%** under the ISP **Step Change** scenario

- 2019 (Actuals)
- 2025 (ISP Central)
- 2025 (ISP Step Change)



Technical areas of study

Managing Distributed PV

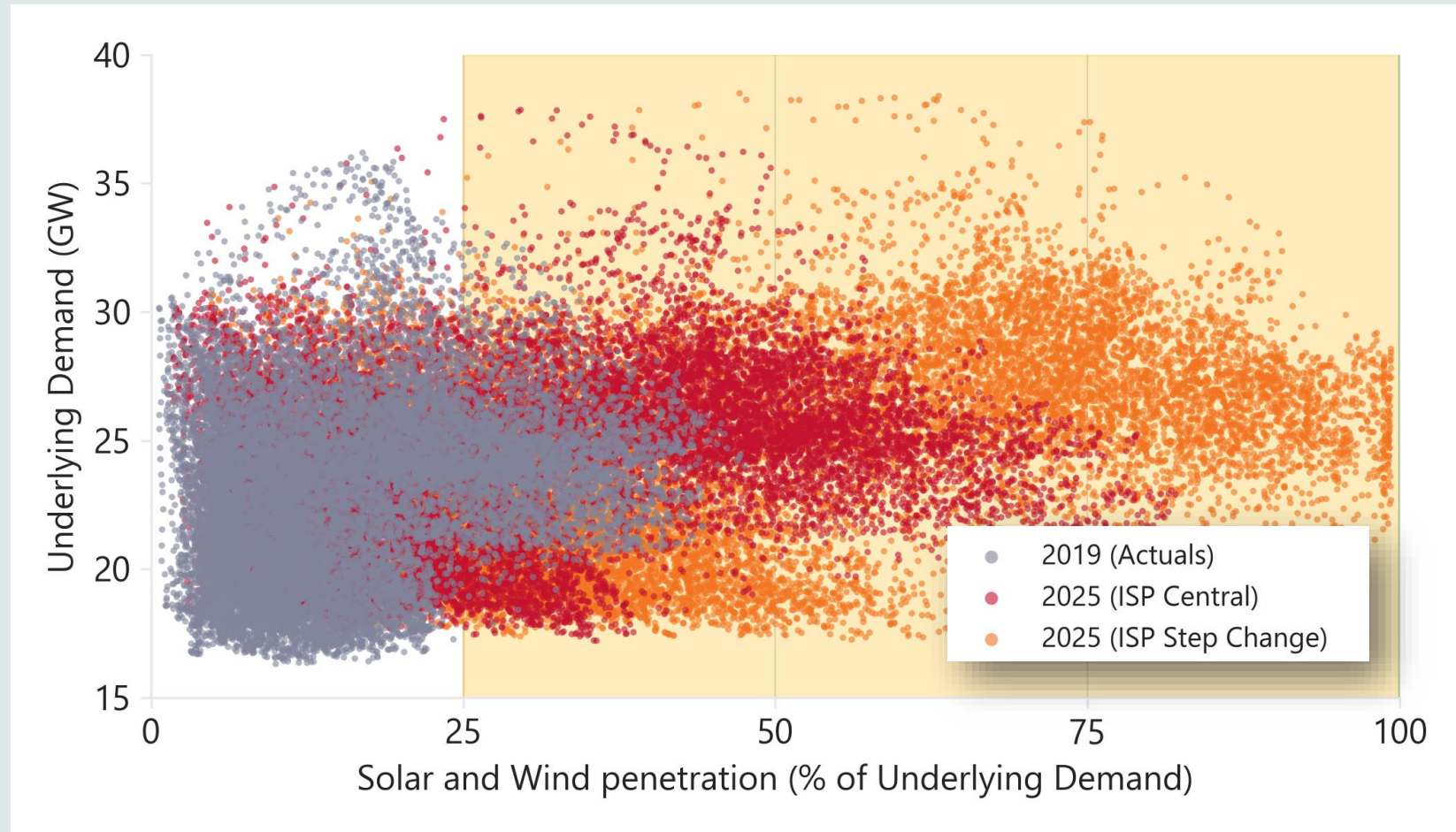
Challenges

- Performance of the DPV is becoming critical
- System dispatchability is decreasing



Actions

- 3.1 – 3.3** Fast-track DPV performance standards and validation
- 3.4 – 3.5** Minimum level of curtailability and visibility



Variability and uncertainty

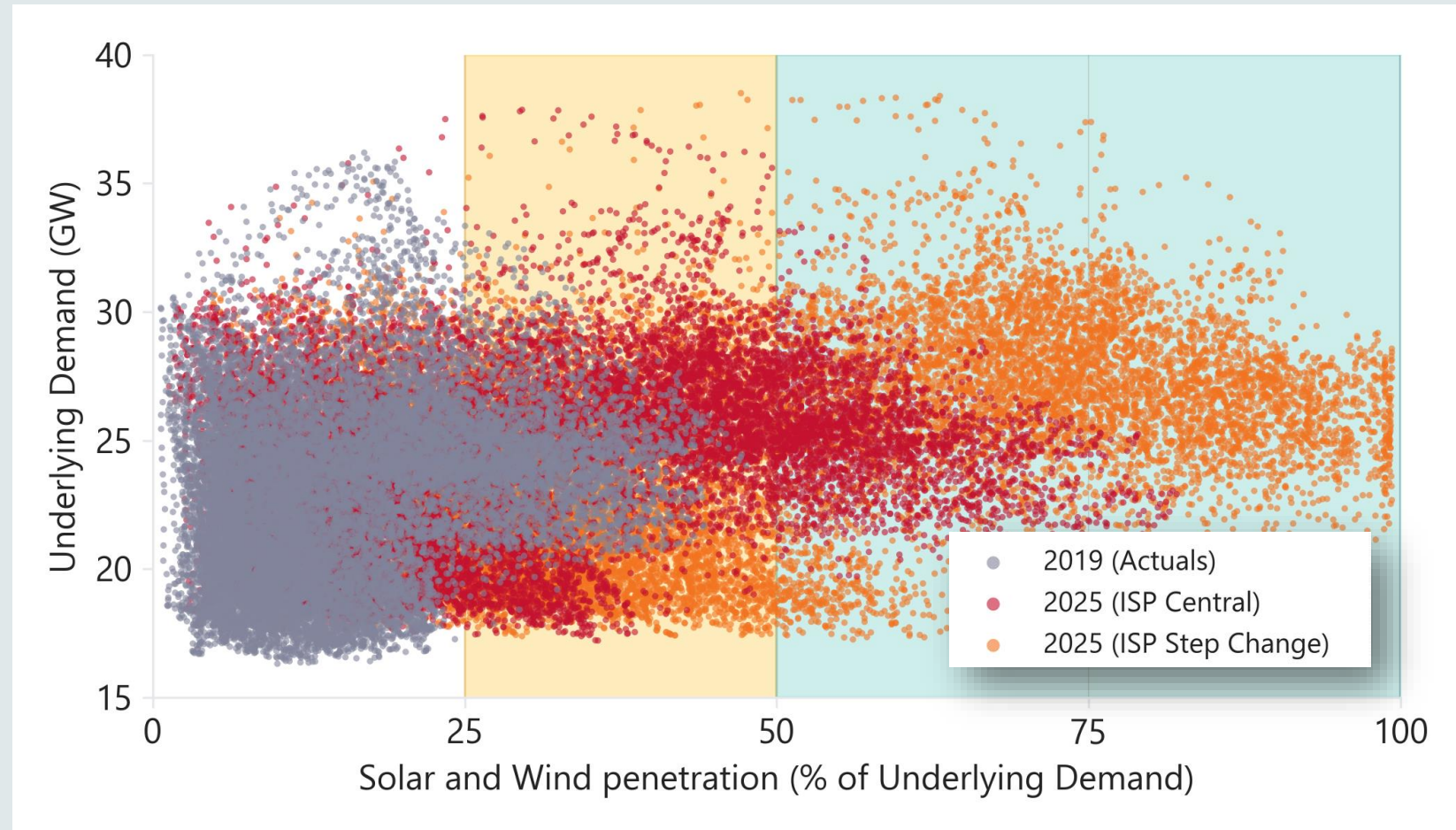
Challenges

- Magnitude of ramps increase by 50%
- Forecasting limitations increase uncertainty
- Ensuring sufficient flexible resources



Actions

- 6.1 Adapt forecasting systems
- 6.2 Improve information provided to support security constrained dispatch
- (2.3) ESB ahead market process to explore options for explicitly valuing flexibility and incorporating into scheduling and dispatch



Managing Frequency

Challenges

- Decline in the primary frequency response
- NEM inertia levels are decreasing

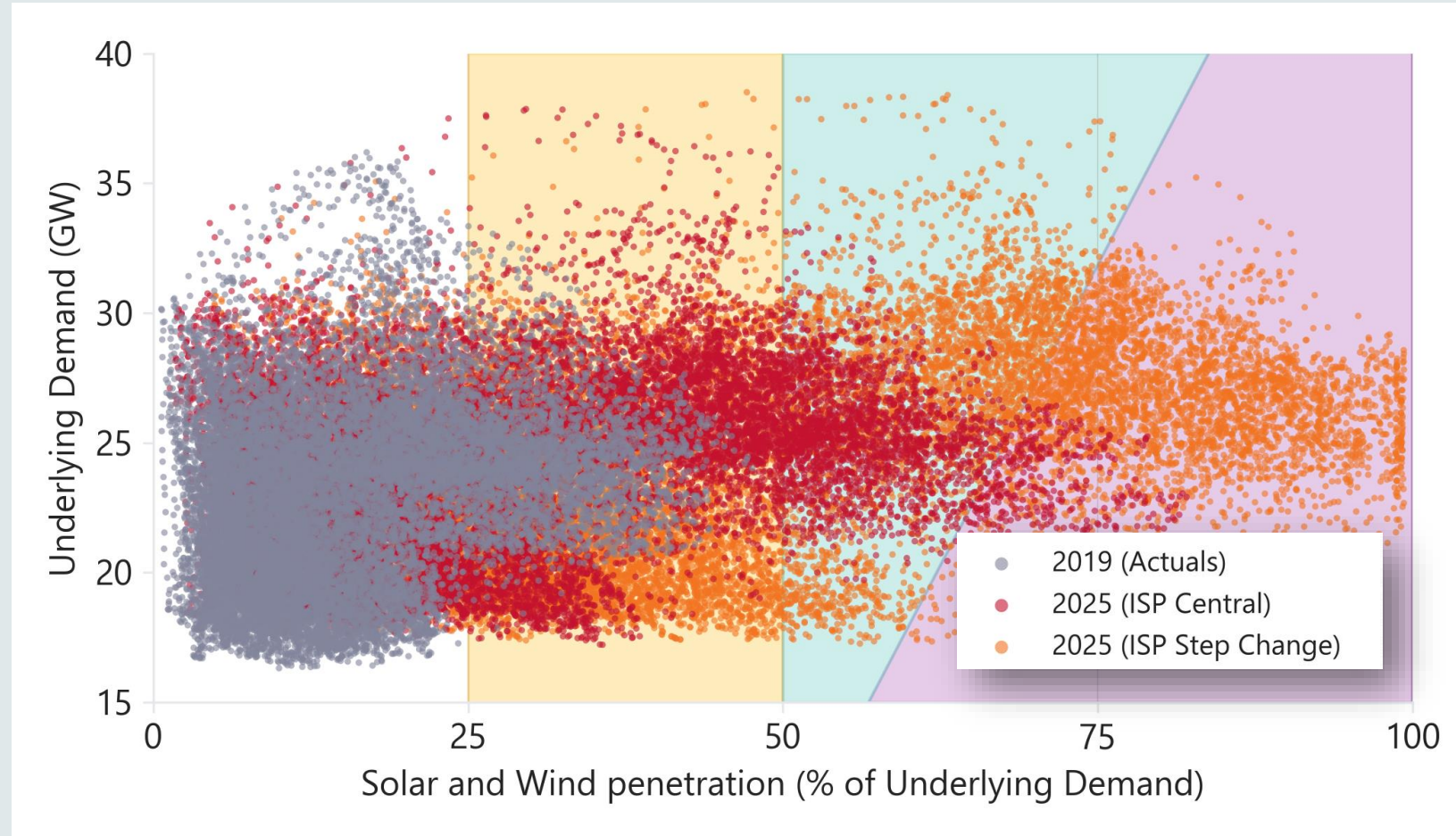


Actions

4.1 Primary Frequency Rule change

4.2 Develop frequency control workplan

- Inertia safety net
- Revise frameworks
- Define RoCoF limits
- DPV impacts on UFLS
- Switched reserve limits
- Regional requirements
- Model improvements



System Strength

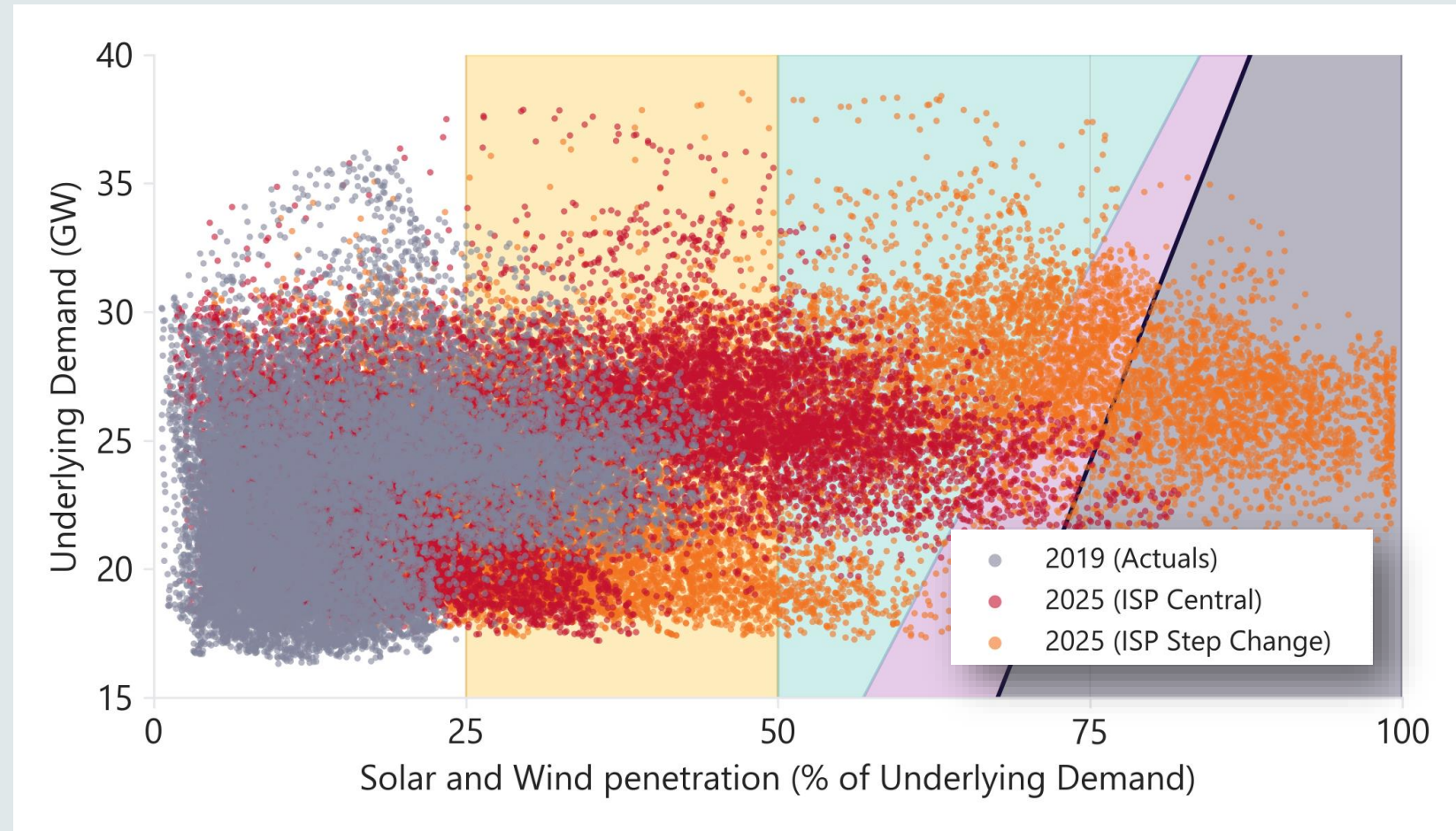
Challenges

- Maintaining minimum system strength levels
- Increasingly complex generator connections



Action

- 5.1** Pursue opportunities to **improve frameworks and system strength coordination** across the NEM
- AEMC and ESB processes
 - ISP through scale-efficient renewable energy zones (REZs) and assessment of market benefits through provision of coordinated system strength services.



Challenges for secure system operation

Challenges

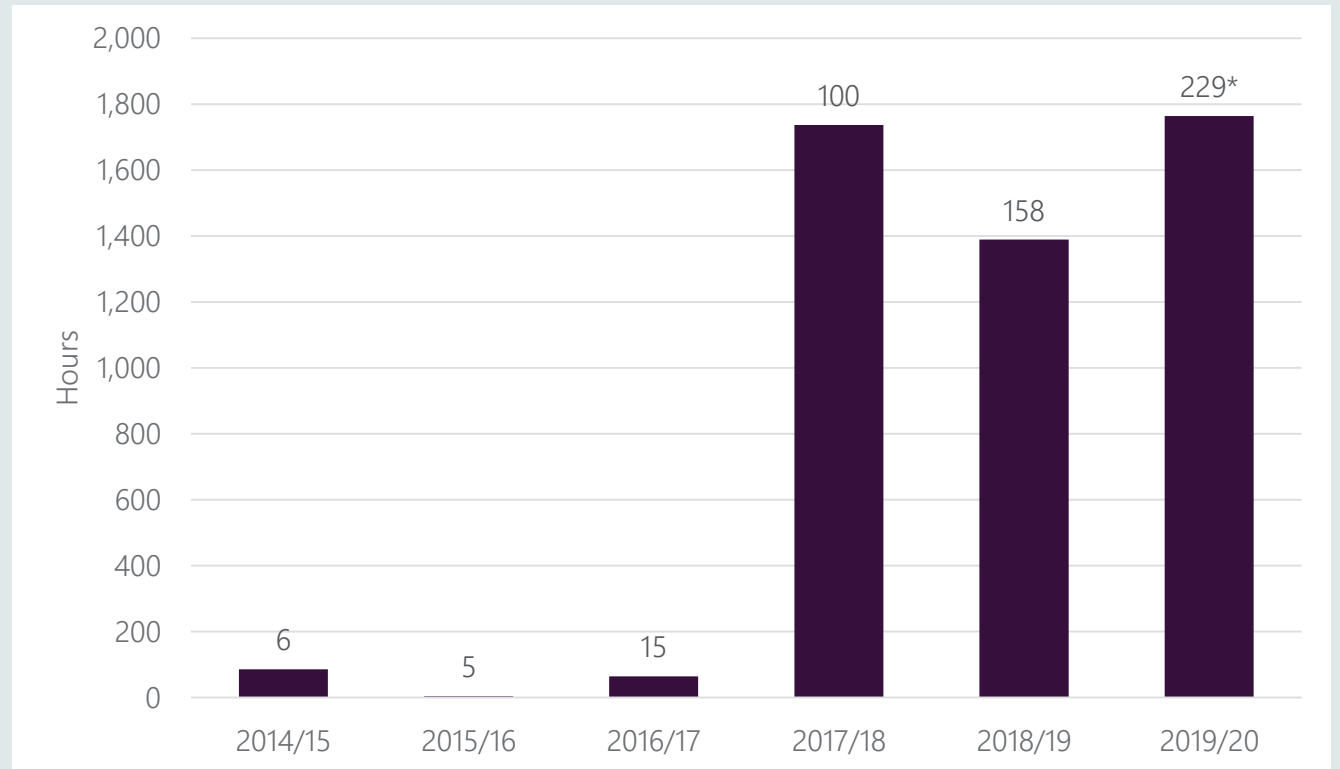
- System is being pushed towards minimum limits. The existing dispatch process was not designed to manage this.
- Increasing complexity
- Increased variability and uncertainty



Actions

- 2.1 – 2.2** AEMO to **redevelop existing scheduling systems** to better account for system needs
- 2.3** **ESB ahead market mechanism** to increase certainty on dispatch of energy and essential system services
- 2.4 – 2.5** **New operational processes, tools, and operator training**

Historical number of directions and duration, 2015-20



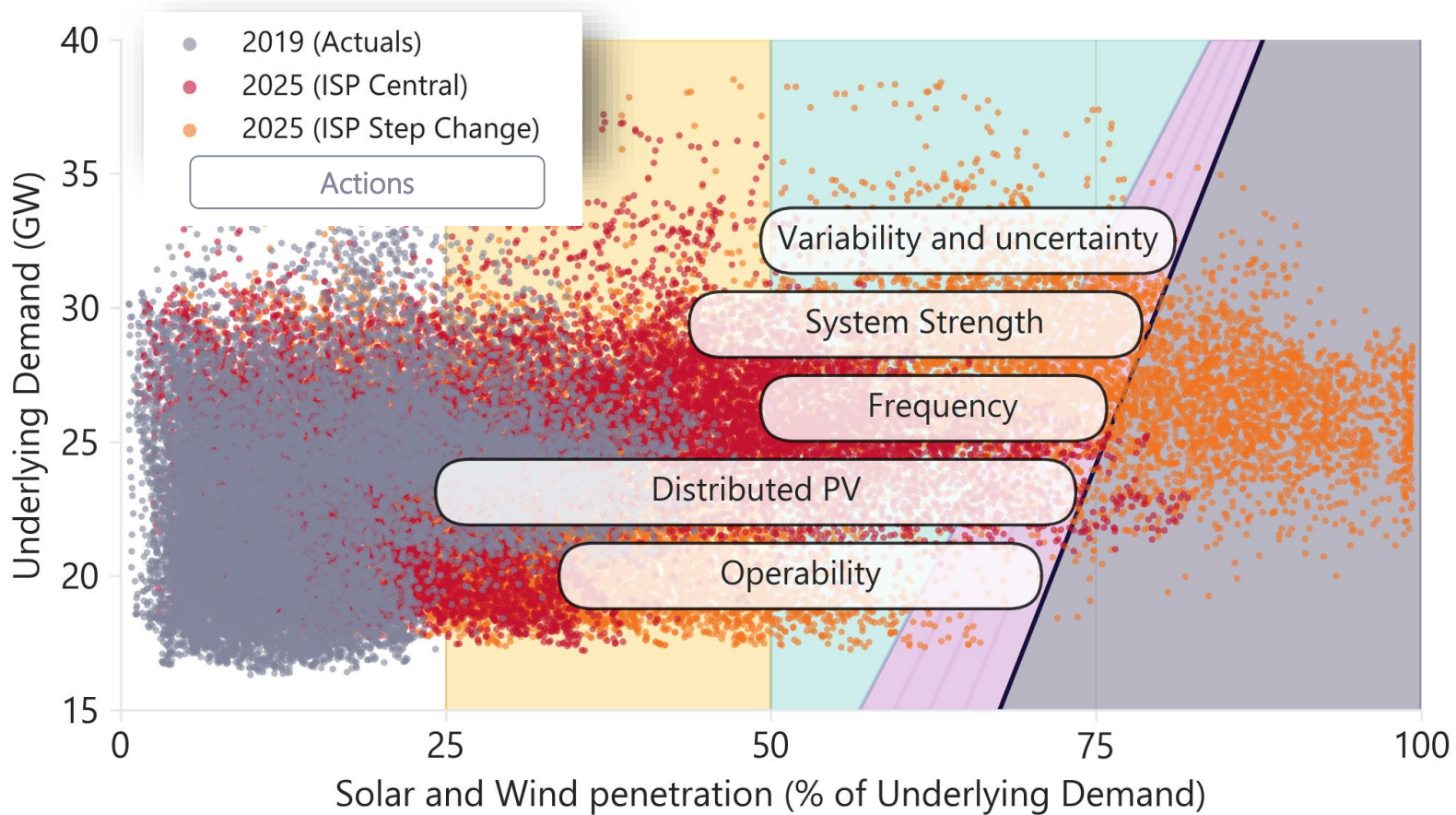
*Incomplete year; data current at 5 March 2020.

Note: values above each column represent number of directions issued.



Managing the transition

Actions to support changing power system



- By 2025 the instantaneous penetration of wind and solar will **exceed 50%**
- The RIS provides an **action plan to securely meet penetrations up to and beyond 75%**
- If **action is not taken, wind and solar may be limited to 50-60%** of total generation
- No insurmountable reasons why the NEM cannot operate securely at even higher levels of instantaneous wind and solar penetration in future.

Going forward ...

Strategic construction of new network capability, identified through **Integrated System Planning**



Significant system transformation possible in the next 5 years

Feedback into Integrated System Planning for cost benefit analysis to **maximise value to end consumers**



Need for **flexible market and regulatory frameworks** that can adapt swiftly and effectively



Opportunity to lead the world in demonstrating the successful operation of a large power system with high levels of wind and solar

Engagement

How to get involved

- Watch the full webinar series
- Videoconference workshops (May/June 2020)
- Written submissions (June 2020)
- AEMO will post relevant engagement information on its **website**



<https://aemo.com.au/energy-systems/major-publications/renewable-integration-study-ris>



For any further enquiries, and lodgement of written submissions, please contact AEMO's Future Energy Systems team at FutureEnergy@aemo.com.au

Watch the rest of the series



